

To Err is Human: Why 2 Hours of Medication Errors?

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Objectives

- Define a medication error
- Describe the Swiss Cheese Effect
- Suggest ways to decrease risk, reduce errors, and improve patient safety
- Analyze the process and requirements for Root Cause Analysis (RCA's) for sentinel events
- Discuss the role of technology in reducing the occurrence of medication errors
- Identify the purpose of ISMP, JCAHO, Leapfrog, the National Safety Forum and the government in regards to medication errors

" Incompetent people are, at most 1% of the problem. The other 99% are good people trying to do a good job who make very simple mistakes and it's the process that set them up to make these mistakes."

Dr. Lucien Leape. Harvard School of Public Health

Statistics

- More Americans die from medical errors than from car accidents, breast cancer, or AIDS annually, 44,000-98,000 deaths/year
- Medication errors result in at least 1 death per day and 1.5 million people injured per year
- Estimated US annual cost of drug-related morbidity and mortality is nearly \$17 billion
- Preventable adverse drug events cost the healthcare system \$2.5 billion annually

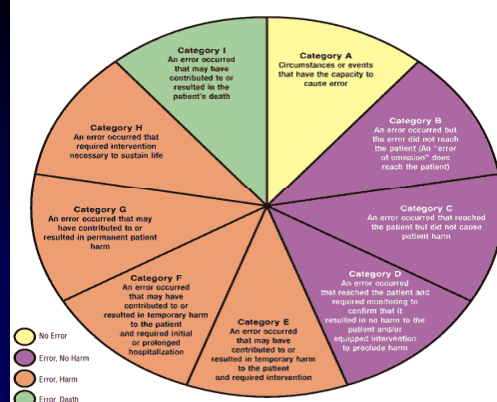
Institute of Medicine, Preventing Medication Errors, 2006

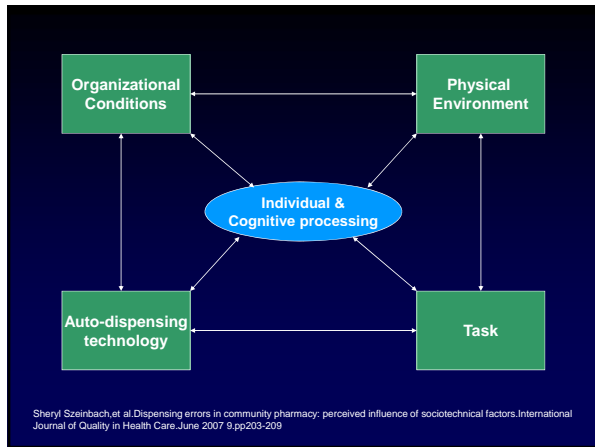
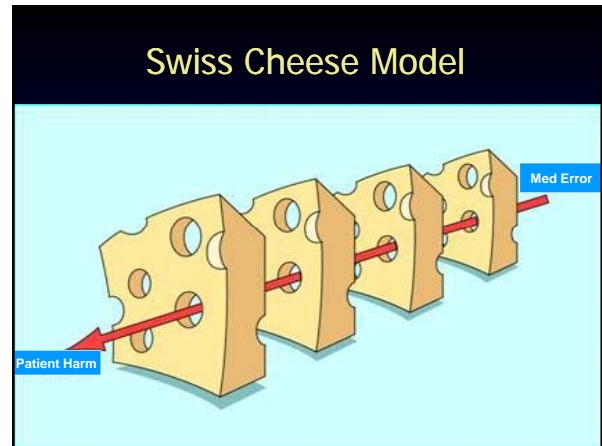
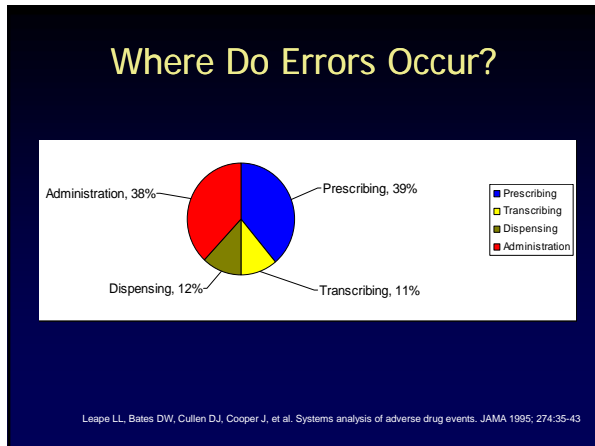
Medication Error Definition

- Any **preventable event** that may cause or lead to **inappropriate medication use** or **patient harm while the medication is in the control of the health care professional, patient, or consumer**. Such events may be related to professional practice, health care products, procedures, and systems, including: prescribing; order communication; product labeling, packaging, and nomenclature; compounding; dispensing; distribution; administration; education; monitoring; and use."

NCC MERP → National Coordinating Council for Medication Error Reporting and Prevention
 National Coordinating Council for Medication Error Reporting and Prevention, Medication Error Index. www.nccmerp.org. Accessed 12/22/2008

Figure 1. NCC MERP Index for Categorizing Medication Errors





- ### Human Factors
- Fear
 - Stress
 - Boredom
 - Substance abuse
 - Frustration
 - Fatigue/Lack of sleep
 - Illness
 - Lack of experience

- ### System Factors
- Inefficient workflow
 - Poorly designed technology
 - Noise
 - Clutter
 - Heat/Cold
 - Motion
 - Lighting
 - Distractions
-

- ### Communication Failures
- Handwriting
 - Oral orders/prescriptions
 - Use of nonstandard abbreviations
 - Incomplete orders
 - Dosage errors

High Risk Patient Population

- Multiple medications
- Children
- Elderly
- Multiple allergies
- Non-English speakers or Non-readers
- Discharge from hospital

High Risk Medications

- Anticoagulants
- Chemotherapy
- Insulin
- Opiates
- Adrenergic agonists



IF YOU DON'T KNOW, ASK!!!!

- There are no stupid questions
- Being "pretty sure" doesn't count
- If something seems wrong, it just might be
- Ask many questions to clarify your concern
- Be sure you are asking the question clearly and the responder understands the question

ALWAYS THINK 5 RIGHTS RULE

The RIGHT

- person
- dose
- medication
- frequency
- route

When taking a verbal prescription...

- Read back
- Spell the name of medication
- Spell out numbers like 17 vs. 70
- Make sure you have all needed information
- Ask for indication
- Do not use unapproved abbreviations
- Do not hesitate to call back for clarification

KEEP AN EYE OUT FOR ADE's

- ADE: Adverse Drug Event
 - Side Effect
 - Adverse Reaction
- Be familiar with **side effects** and **adverse reactions** that may occur with medications you have dispensed
- **Document** and speak with other healthcare professionals for specific monitoring required or additional patient care

Report Errors and Potential Errors

- Errors will happen, you must know how to deal with them
- Understand definitions to classify errors
 - Harm, Monitoring, Intervention, Intervention Necessary to Sustain Life
- Know process for reporting errors
- Collect information
- Errors that may error are just as important to report to avoid them from happening

English? Not necessarily?

- Do not assume that foreign born patients who speak English will understand a prescription label written in English
- **Assess** patient's level of comprehension
- See if patient seems able to properly read directions
- **Ask** the patient leading questions
- **Engage** patients
- **Provide** education sheets

Errors will Happen

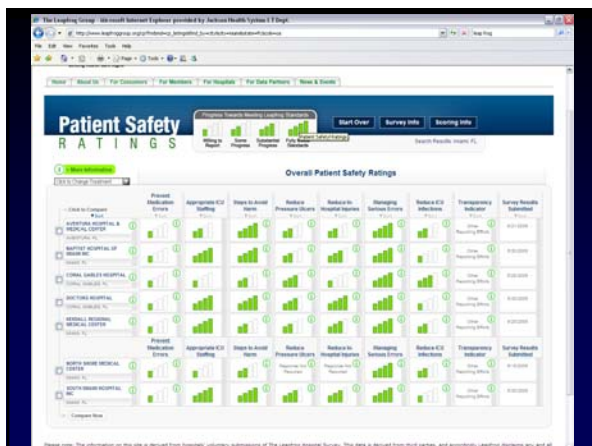
- Report incidents and reactions that occur
 - Tracking incidents will help put actions into place to make sure they don't happen again
- Learn from each others mistakes
 - When incidents occur act calmly and ask questions to develop ways to put changes into practice



Mission Statement

- Trigger giant leaps forward in the safety, quality and affordability of health care by...
 - Supporting informed healthcare decisions by those who use and pay for health care
 - Promoting high-value health care through incentives and rewards

<http://www.leapfroggroup.org>



Question #1

- **The NCC MERP defines a medication error as:**
 - A. Any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer
 - B. An event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer
 - C. Any preventable event that may cause or lead to inappropriate medication use while the medication is in the control of the health care professional
 - D. None of the above

Drug Information Sources & Medication Errors

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Objectives

- Describe drug information resources and their role in preventing errors
- Review the process and requirements for root cause analysis (RCA) and sentinel event
- Discuss additional approaches to critical analysis of process and design

Background

Drug Information (DI) Resources

- WHAT are they?
 - an integral part of the medication use system
- WHY use them?
 - Lack of knowledge of the medication in use increases the risk of error
 - RPh involvement in internal informational resources help to prevent errors

Ideal Characteristics of a Drug Information Source

- Sound editorial policies
- High quality controlled content development
- Expert review
- Unbiased
- Ongoing updating process
- Correction notification
- Guideline incorporation

FDA Approved Labeling Deficiencies

- Referred to as the "Package Insert"
- Can only contain information regarding **FDA approved** indications and information related to the studies submitted for approval
- Will not contain "off-label" use information
 - Eg., **metronidazole**
- Not a reliable source for current place in therapy

Labeled and Unlabeled Uses

- Some DI sources include information only on uses described in the package insert
 - Eg., *Physician's Desk Reference* (PDR)
- Resource for unlabeled uses:
 - Medical information search engines
 - Eg., Medline and PubMed
 - Guideline websites
 - www.guidelines.gov

Internet Based Information

PRO's	CON's
<ul style="list-style-type: none"> • Growing source of information • Wide variety with quick access 	<ul style="list-style-type: none"> • Unknown sources information • Lack of Standardization

Disclosure on the Internet

- The US Department of Health and Human Services suggest disclosure of:
 - Identity of developers and contact information
 - Purpose of the site
 - References
 - Protection of privacy and confidentiality
 - Evaluation of the site
 - How the content is updated

Evidence Based Medicine (EBM)

- Medical practice based on best available current research - *Mosby Medical Dictionary, 8th ed*
- Primary literature
 - Randomized Controlled Trials (RCT)
 - Meta and pooled analysis
- Can be found in medical journals
- Should be evaluated by a qualified group of practitioners for inclusion in a resource

Drug Information Development

- DI resources should help with guiding clinician decisions
- Should include guideline information
 - Dosing recommendations
 - Indications
 - Place in therapy
 - Warnings and Precautions

AHFS DI

Ans: B & C



Which of the following are **TRUE**?

- A. Sponsored by manufacturers
- B. Labeled and off-label uses
- C. Evidence-based

Federally Recognized DI Resources

Drug information references:

- American Hospital Formulary Service Drug Information (**AHFS DI**)
- Drugdex
- United States Pharmacopeia Drug Information (**USP DI**)

CMS Revises Compendium List

- **In 1993**, CMS recognized America "...Medical Association Drug Evaluations (AMA-DE), AHFS and USP as authoritative compendiums..."
- **In 2008**, new list added:
 - NCCN Drug and Biologics Compendium
 - Clinical Pharmacology
 - Drugdex

Annals Intern Med. 2009; 150:348-350

Additional Medication Error Resources

- The Joint Commission (TJC)
 - www.jointcommission.org
- National Coordinating Council for Medication Error Reporting and Prevention (NCCMERP)
 - www.nccmerp.org
- Institute of Safe Medical Practice (ISMP)
 - www.usp.org
- National Patient Safety Foundation (NPSF)
 - www.npsf.org
- Food and Drug Administration (FDA)
 - www.fda.gov



Internal Information and Analysis

Internal Information Sources

- Drug utilization evaluation (DUE)
- Root Cause Analysis (RCA)
- Failure Mode and Effects Analysis (FMEA)
- Process improvement
- "Dashboards"
- And other quality improvement and assurance initiatives

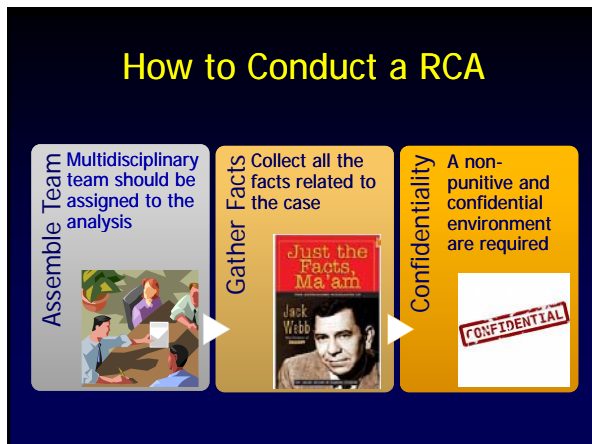
Definitions

- **Root Cause Analysis (RCA)**
 - A retrospective tool used to find the true cause of an error
- **Sentinel Event**
 - An unexpected occurrence involving **death or serious physical or psychological injury**, or the risk thereof

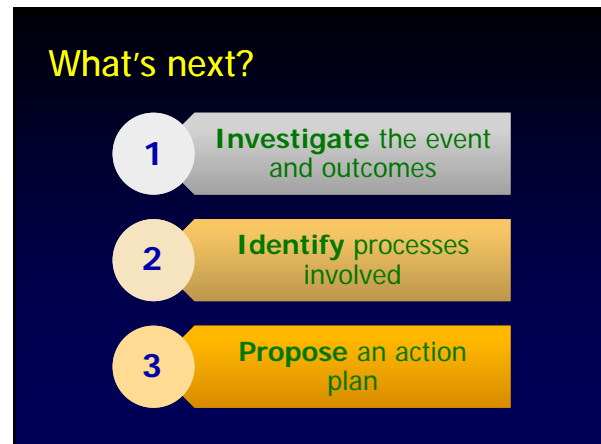
When to Use RCA?

- A serious event occurred that caused, or could have caused, patient harm
 - Sentinel Events
 - "Near-misses" may prompt RCA
 - Repeated behavior that could result in patient harm
- Sentinel events should always be followed up with a RCA

How to Conduct a RCA



What's next?



Examples of Areas to Review

- Patient-identification
- Competency assessment
- Supervision of staff
- Availability of information
- Adequacy of technological support
- Equipment maintenance and management
- Physical environment
- Storage and access of medication
- Labeling of medication



TJC Minimum Scope of Root-Cause Analysis for Specific Types of Sentinel Events

Failure Mode and Effects Analysis (FMEA)

- **Prospective**
- A team-based, systematic, and proactive approach for **identifying** the ways that a **process or design can fail**, why it might fail, and how it can be made safer

Hospital Pharmacy, 41(5), 470-6.

FMEA Process

- Select a high-risk process & assemble a team
- Diagram the process
- Brainstorm potential failures
- Prioritize failure modes
- Identify root cause of failure modes
- Redesign the process
- Analysis and test the new process
- Implement and monitor the redesign process

Other Considerations...

Human Factor Engineering (HFE) Analysis



...a focused look at human capabilities and how they are applied to system design

...e.g., training, computer interfaces, pharmacy errors to RPh, and pharmacy layout

In summary

- Be **proactive!**
- Remember that all information sources are not created equally
- Systematic approaches can be used to analyze and correct major events
- Get involved in or start up internal sources of information gathering

Use of Technology to Prevent Medication Errors

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Objectives

- Explain technology's role in reduction of medication errors
- Describe the different automations systems available to decrease medication error
- Discuss the impact of E-prescribing on error prevention

Introduction

- Technology plays an important role in the delivery of healthcare
- Appropriate utilization of technology is very important to prevent errors
 - Evaluation of effectiveness should be done routinely
- Increases potential of new types of errors

How can Technology Improve Outcomes

- Prevent errors
- Streamline care
- Assist in decisions
- Increase in delivery of patient care services
- Increase in pharmacist productivity

Technology

- Pharmacy information systems
- Barcode scanning
- Automatic dispensing machines
- E-prescribing

Pharmacy Information Systems

- Complex computer systems
 - Designed to meet the needs of a pharmacy
- Alerts/Warnings
 - Effective method for identifying drug interaction
- Forcing functions
 - Prompts pharmacist to input specific patient information before processing prescription
 - Allergies

Pharmacy Information Systems

- Pharmacy information systems roles in pharmacy
 - Clinical screening
 - Inventory management
 - Patient drug profiles
 - Interactivity with other systems

Pharmacy Information Systems

- Clinical screening
 - Drug interaction
 - Drug allergies
 - Appropriate dose
- Patient profiles
 - Medications
 - Current
 - Past
 - Allow to access databases of other pharmacies

Drug Information

- May require online access
- Many options available
 - Micromedex, Lexicomp, Clinical pharmacology, etc.
- Allow you to prevent error by...
 - Evaluating drug interactions
 - Compatibilities, drug-drug, herbal, etc.
 - Drug identifier

Barcode Scanning

- Many functions
 - Prescription refilling
 - Allows for the right medication to be refilled
 - Medication filling
 - Label won't print if wrong drug is being scanned
 - Medication ordering
 - Final prescription dispensing



Automatic Dispensing Machines

- Many different dispensing machines available
 - ScriptPro, Parata, AutoMed, etc.
- Can hold numerous medications
- Maximize barcode technology
- Accurate counting



AutoMed/OptiFill II



E-prescribing

- What is E-prescribing
 - A **prescriber's ability to electronically send** an accurate, error-free, and understandable prescription directly to a pharmacy from the point-of-care
- Important element in improving the quality of patient care
- Play a vital role in medication error prevention

E-prescribing

- Improves the overall prescribing process
 - Eliminates faxes
 - Reduces or eliminates phone calls
 - Streamlines refill's requests
 - Increases patient compliance
 - Improves formulary adherence
 - Eliminates prescription forgery

E-prescribing

- Improve safety and quality of care
 - Decreases the risk of medication errors
 - Eliminates Illegibility
 - Provides warning and alerts
 - Allow access to patients medical history
- Improve efficiency
 - Offers provider mobility
 - Links with pharmacy systems

Caution

- Automation is not perfect
- Can lead to increase in other types of errors
- Is only as good as the human performing the function



Conclusion

- Technology has changed the way a pharmacy functions
- Automation cannot prevent all errors
- It can provide safeguards not possible by manual processes

Question 1

- T/F - The most accurate way to assure the drug dispensed matches the drug on the prescription label is to compare the NDC number on the stock bottle with the prescription label

Question 2

- T/F - With new technology such as central fill and E-prescribing, pharmacists no longer have to worry about making medication errors

Dangerous Abbreviations & Illegible Writing

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"Let them adhere to the Latin, or Fejee, if they choose, but discard abbreviations, and form their letters as if they had been to school one day in their lives, so as to avoid the possibility of mistakes on that account."

-Mark Twain, October 1, 1864

The Joint Commission (TJC)

- Committed to...
 - continually enhance the value of its accreditation and certification programs
 - developing, utilizing, and maintaining valid and reliable performance measures
 - ensure that the accreditation process is publicly accountable
 - making patient safety an imperative in all accredited organizations
 - addressing pressing public policy issues that impact the quality and safety of health care



TJC "Do Not Use" List

Do Not Use	Potential Problem	Use Instead
U (unit)	Mistaken for 0 (zero), the number 4 (four), or "cc"	"unit"
IU (International Unit)	Mistaken for IV (intravenous) or the number 10 (ten)	"International Unit"
Q.D., OD, q.d., qd (daily)	Mistaken for QID, QOD, numeric symbols, etc.	"daily"
Q.O.D., QOD, q.o.d., qod (every other day)	Period after Q mistaken for "I" and the "O" mistaken for "I"	"every other day"

Available at: jointcommission.org/

TJC "Do Not Use" List

Do Not Use	Potential Problem	Use Instead
Trailing zero (X.0 mg)	Decimal point is missed	"X mg"
Lack of leading zero (.X mg)	Decimal point is missed	"0.X mg"
MS	Can mean: morphine sulfate or magnesium sulfate	"morphine sulfate"
MSO ₄ and MgSO ₄	Confused for one another	"magnesium sulfate"

Available at: jointcommission.org/

Possible Inclusions

Do Not Use	Potential Problem	Use Instead
> (greater than) & < (less than)	Misinterpreted for the number 7 (seven) or the letter L; confused for one another	"greater than" & "less than"
Abbreviations for drug names	Misinterpreted because of similar abbreviations for multiple drugs	Write drug names in full
Apothecary Units	Unfamiliar to many practitioners, confused with metric units	Use metric units

Available at: jointcommission.org/

Possible Inclusions

Do Not Use	Potential Problem	Use Instead
@	Mistaken for the number 2 (two)	"at"
cc	Mistaken for U (units) when poorly written	"mL" or "milliliters"
µg	Mistaken for mg (milligrams), resulting in 1,000 fold overdose	"mcg" or "micrograms"

Available at: jointcommission.org/

Institute of Safe Medication Practices (ISMP)

Mission

To advance patient safety worldwide by empowering the healthcare community, including consumers, to prevent medication errors

Vision

To be the premier independent, patient safety organization leading the effort to prevent medication errors and adverse drug events

Available at: ISMP.org/



Error-prone Abbreviations

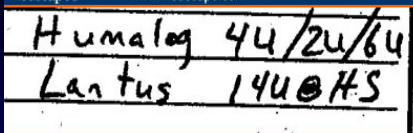
Abbreviations				
AD	AU	AS	OD	OS
OU	BT	cc	D/C	IJ
HS	OJ	qhs	ss	q1d
Drug Names				
ARA	AZT	CPZ	HCl	HCTZ
PCA	PTU	T3	TNK	ZnSO ₄

Available at: ISMP.org/

Transcription Error

Medscape www.medscape.com

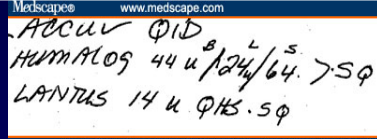
"U" for units looks like a 4



Source: Medication Safety Alert © 2004 Institute for Safe Medication Practice

Medscape www.medscape.com

When ordering Humalog, the physician misread U on the patient history as 4



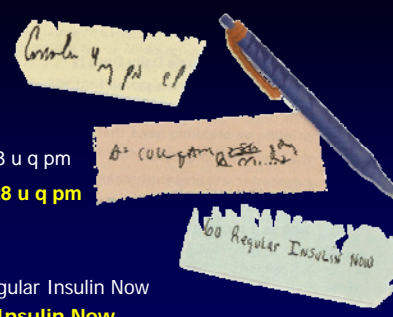
Source: Medication Safety Alert © 2004 Institute for Safe Medication Practice

Legibility Error

Avandia
Coumadin

10 u (units) q am & 8 u q pm
10 u (units) q am, 28 u q pm

6 u (units) Regular Insulin Now
60 Regular Insulin Now




Jury blames doctor's bad penmanship for patient death

AT A GLANCE

The first negligence judgment against a doctor for illegible handwriting puts the focus on the need for system changes and provides a needed wake-up call.

Linda G. Prager
ANNALS STAFF



JURORS BLAMED this illegible prescription for the death of a Texas man. Although it allegedly calls for Inordil, the pharmacist filled it as Plondil. The jury's \$450,000 judgment, finding both the cardiologist and pharmacist negligent, is believed to be the first of its kind nationwide to focus solely on bad handwriting.

Abbreviation Error

25 u / hr

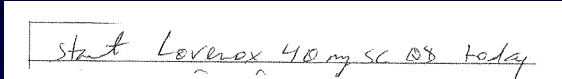
25 units / hour OR 25 milliliters / hour?

Abbreviation Error

Flomax 0.4 mg po QID

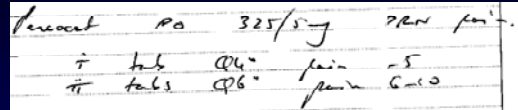
QD (Daily) was mistaken for QID (Four Times a Day)

Illegible Order



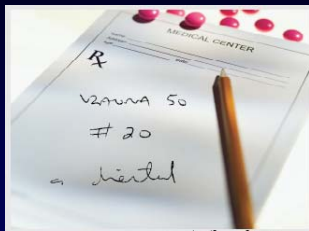
QD (Daily) or Q 8?

Illegible Order



One tablet q 4 hours or q 6 hours?

Pharmacy Times Can You Read These Rx's?



Viagra 50 mg #20, Take as Directed

Available at: pharmacytimes.com/rxs

Patient Cases

- Misplaced decimal / abbreviation error
- Dosing error
- Route of administration error
- Prescribing errors

Case 1

- Nine-month old dies after misplaced decimal causes 10-fold morphine overdose
- Physician orders Morphine .5 mg IV for post-op pain, unit secretary does not see the decimal and transcribes the order as Morphine 5 mg IV
- Experienced nurse administers 5 mg of Morphine and repeats the dose 2 hours later
- Four hours later baby stops breathing

Washington Post, April 20, 2001

Case 2

- 44 y/o F in Florida died in an emergency department after receiving 8,000 mg IV phenytoin instead of 800 mg
- Experienced nurse administered overdose
 - 32 vials of 50 mg / mL, 5 mL
 - Required removing medication from several automated dispensing machines

ISMP Medication Safety Alert, March 8, 2007

Case 3

■ Ohio, USA

- An elderly Ohio woman died after she received IV injection of potassium phosphate that was supposed to be administered via a feeding tube

ISMP Medication Safety Alert, March 8, 2007

Changing Current Practices

- Education / Awareness
 - Secretaries
 - Nurses
 - Physicians
 - Pharmacists
- Changing current systems
 - Standardized order forms
 - Enhanced error reporting
 - Employer-specific initiatives

Regulations

- TJC (The Joint Commission)
 - Do **not** use abbreviations
 - National Patient Safety Goals
 - (NPSG.02.02.01)
- ISMP (Institute for Safe Medication Practices)
 - Error-prone abbreviations list
 - High-alert Medication list

National organization support

- NCCMERP
 - National Coordinating Council for Medication Error Reporting and Prevention
 - Composed of 24 independent organizations
 - Error Reporting, Practice Recommendations
- ADA no longer uses “u” in publications
- *American Journal of Nursing* has incorporated TJC Do Not Use list into its editorial style

NCCMERP.org/

Safe Medication Prescribing

- Order should be complete
- Intent should be clear and unambiguous
- Written orders should be legible
- Use verbal or telephone orders only when necessary
- Patient account of medication history does not confirm appropriateness or accuracy

ASHP guidelines on preventing medication errors in hospitals. AJHP 1993

Avoidance of Ambiguous and Unclear Orders

- Write out instructions, do not use abbreviations
- Do not use vague instructions (e.g. use as directed, PRN without a reason, etc)
- Specify dose
- Avoid un-established abbreviated names
- If unsure of spelling, look-up or ask
- Use the metric system

Discussion

- Despite flow of error reports, practitioners still question evidence supporting prohibiting dangerous abbreviations
 - Difficult to perform studies
 - Lack of data

Resources / Advocacy

- TJC – The Joint Commission
 - Formerly known as JCAHO
- ISMP – Institute for Safe Medication Practices
- NCCMERP – National Coordinating Council for Medication Error Reporting and Prevention
- FDA – Food and Drug Administration

True / False Questions

1. It is appropriate to use IU as an abbreviation for International Units.

True / False Questions

2. It is acceptable to substitute Mag SO₄ in place of the dangerous abbreviation MgSO₄.

True / False Questions

3. The Institute for Safe Medication Practices website (ISMP.org) is not a reliable source for obtaining information about how to prevent medication errors.

Question 3

- **T/F** - E-prescribing can reduce medication errors by preventing ambiguous medication orders.